In the Specification

Before paragraph [0001], please insert the following:

Related Application

This is a §371 of International Application No. PCT/JP2005/001563, with an international filing date of January 27, 2005 (WO 2005/071301 A1, published August 4, 2005), which is based on Japanese Patent Application No. 2004-018368, filed January 27, 2004.

Kindly replace paragraph [0002] with the following:

BACKGROUND ~~ART~~

The main material of a tube for automobile piping is shifting from a metal to a lightweight resin, with an excellent rust-preventing property, so as to overcome an old problem of rusting due to anti-freeze agents on roads or to meet the recent requirement for energy saving which is a pressing issue in view of the prevention of global warming. The resin usually used for the piping tube includes a polyamide-based resin, a saturated polyester-based resin, a polyolefin-based resin, a thermoplastic polyurethane-based resin and the like. However, a single-layer tube using such a resin is insufficient in heat resistance, chemical resistance and the like and, therefore, the applicable range thereof is limited.

Kindly replace paragraphs [0008] through [0015] with the following:

~~An object of the present invention is to solve these problems and~~It would therefore be helpful to provide a multilayer tube excellent in an alcohol gasoline permeation-preventing property, ~~in~~ interlayer adhesion, ~~in~~ low-temperature impact resistance, ~~in~~ heat resistance and/or ~~in~~ chemical resistance.

~~DISCLOSURE OF THE INVENTION~~SUMMARY

~~As a result of intensive investigations to solve those problems, the present inventors have~~We found that a multilayer tube comprising a layer formed of polyamide 11 and/or polyamide 12, a layer formed of a semi-aromatic polyamide having a specific structure, and a layer formed of a fluorine-containing polymer having introduced into the molecular chain thereof a functional group having reactivity with a polyamide-based resin ensures that both the interlayer adhesion and the alcohol gasoline permeation-preventing property are satisfied and that various properties, such as low-temperature impact resistance, heat resistance and chemical resistance, are excellent.

~~More specifically, the present invention relates to a~~We provide multilayer tubes comprising at least three or more layers including:

a layer (a) comprising (A) polyamide 11 and/or polyamide 12,

a layer (b) comprising (B) a polyamide (semi-aromatic polyamide) comprising a dicarboxylic acid unit containing a terephthalic acid and/or naphthalenedicarboxylic acid unit in a proportion of 50 mol% or more based on all the dicarboxylic acid units, and a diamine unit containing an aliphatic diamine unit having a carbon number of 9 to 13 in a proportion of 60 mol% or more based on all the diamine units, and

a layer (c) comprising (C) a fluorine-containing polymer having introduced into the molecular chain thereof a functional group having reactivity with a polyamide-based resin.

~~In a preferred embodiment, the present invention~~One aspect relates to a multilayer tube comprising at least four or more layers including:

a layer (a) comprising (A) polyamide 11 and/or polyamide 12,

a layer (b) comprising (B) a polyamide (semi-aromatic polyamide) comprising a dicarboxylic acid unit containing a terephthalic acid and/or naphthalenedicarboxylic acid unit

in a proportion of 50 mol% or more based on all the dicarboxylic acid units, and a diamine unit containing an aliphatic diamine unit having a carbon number of 9 to 13 in a proportion of 60 mol% or more based on all the diamine units,

a layer (c) comprising (C) a fluorine-containing polymer having introduced into the molecular chain thereof a functional group having reactivity with a polyamide-based resin, and

a layer (d) comprising (D) a terminal modified polyamide satisfying [A]>[B]+5, wherein [A] is the terminal amino group concentration (μeq/g-polymer) of the polyamide and [B] is the terminal carboxyl group concentration (μeq/g-polymer) of the polyamide.

The multilayer tube ~~of the present invention is assured of~~has both interlayer adhesion and an alcohol gasoline permeation-preventing property and satisfies with various properties such as low-temperature impact resistance, heat resistance and chemical resistance. In particular, the permeation and evaporation of alcohol-mixed hydrocarbon through the tube walls can be suppressed to the maximum, and strict environmental regulations can be complied with. Furthermore, reduction in the interlayer adhesion after immersion in fuel, which is seen in a multilayer tube comprising a polyamide-based resin and a polyester-based or polyphenylene sulfide-based resin having excellent alcohol gasoline permeation-preventing property, does not occur, and a high fuel resistance of the interlayer adhesive strength is obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a transverse cross-sectional view of an Example of a multilayer tube ~~of an Example according to the present invention~~.

Fig. 2 is a transverse cross-sectional view of a multilayer tube of another Example ~~according to the present invention~~.

Fig. 3 is a transverse cross-sectional view of a multilayer tube of still another Example ~~according to the present invention~~.

Kindly replace paragraphs [0017] and [0018] with the following:

~~BEST MODE FOR CARRYING OUT THE INVENTION~~DETAILED DESCRIPTION

~~The present~~Selected, representative aspects of the invention ~~is~~are described in detail below.

The (A) polyamide 11 ~~for use in the present invention~~ is typically a polyamide having an acid amide bond (-CONH-), represented by the formula: $(-CO-(CH_2)_{10}-NH-)_n$, and can be obtained by polymerizing 11-aminoundecanoic acid or undecanelactam. The polyamide 12 is typically a polyamide having an acid amide bond (-CONH-), represented by the formula: $(-CO-(CH_2)_{11}-NH-)_n$, and can be obtained by polymerizing 12-aminododecanoic acid or dodecanelactam.

Kindly replace paragraph [0023] with the following:

Also, the (A) polyamide 11 and/or polyamide 12 ~~for use in the present invention~~ may be a homopolymer, a mixture of homopolymers, a mixture with the above-described copolymer, or a mixture with other polyamide-based resins or other thermoplastic resins. In the mixture, the content of the polyamide 11 and/or polyamide 12 is preferably 60 wt% or more, more preferably 80 wt% or more.

Kindly replace paragraph [0026] with the following:

In the (A) polyamide 11 and/or polyamide 12 ~~for use in the present invention~~, a plasticizer is preferably added. Examples of the plasticizer include benzenesulfonic acid alkylamides, toluenesulfonic acid alkylamides and hydroxybenzoic acid alkyl esters.

Kindly replace paragraph [0032] with the following:

In the (A) polyamide 11 and/or polyamide 12 ~~for use in the present invention~~, an impact resistance improver is preferably added. The impact resistance improver includes a rubber-like

polymer, and the flexural modulus thereof as measured according to ASTM D-790 is preferably 500 MPa or less. If the flexural modulus exceeds this value, a sufficiently high impact resistance improving effect may not be obtained.

Kindly replace paragraph [0045] with the following:

In the (A) polyamide 11 and/or polyamide 12 ~~for use in the present invention~~, an antioxidant, a heat stabilizer, an ultraviolet absorbent, a light stabilizer, a lubricant, an inorganic filler, an antistatic agent, a flame retardant, a crystallization accelerator and the like may be further added, if desired.

Kindly replace paragraph [0048] with the following:

The (B) semi-aromatic polyamide ~~for use in the present invention~~ comprises a dicarboxylic acid unit containing a terephthalic acid and/or naphthalenedicarboxylic acid unit in a proportion of 50 mol% or more based on all dicarboxylic acid units, and a diamine unit containing an aliphatic diamine unit having a carbon number of 9 to 13 in a proportion of 60 mol% or more based on all diamine units (hereinafter, this polyamide is sometimes referred to as a "(B) semi-aromatic polyamide").

Kindly replace paragraph [0054] with the following:

The diamine unit in the (B) semi-aromatic polyamide may contain a unit derived from other diamines except for an aliphatic diamine unit having a carbon number of 9 to 13 within a range of not impairing various excellent properties of the multilayer tube ~~of the present invention~~. Examples of the other diamine unit include units derived from an aliphatic diamine such as ethylenediamine, 1,3-propylenediamine, 1,4-butanediamine, 1,5-pentanediamine, 1,6-hexanediamine, 1,7-heptanediamine, 1,8-octanediamine, 1,14-tetradecanediamine, 1,15-pentadecanediamine, 1,16-hexadecanediamine, 1,17-heptadecanediamine, 1,18-octadecanediamine, 1,19-nonadecanediamine, 1,20-

eicosanediamine and 2/3-methyl-1,5-pentanediamine; an alicyclic diamine such as 1,3/1,4-cyclohexanediamine, 1,3/1,4-cyclohexanedimethylamine, bis(4-aminocyclohexyl)methane, bis(4-aminocyclohexyl)propane, bis(3-methyl-4-aminocyclohexyl)methane, bis(3-methyl-4-aminocyclohexyl) propane, 5-amino-2,2,4-trimethyl-1-cyclopentanemethylamine, 5-amino-1,3,3-trimethylcyclohexanemethylamine, bis(aminopropyl)piperazine, bis(aminoethyl)piperazine, norbornanedimethylamine and tricyclodecanedimethylamine; and an aromatic diamine such as p-phenylenediamine, m-phenylenediamine, p-xylylenediamine, m-xylylenediamine, 4,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylsulfone and 4,4'-diaminodiphenyl ether. One species or two or more species thereof may be used. The content of the other diamine unit is 40 mol% or less, preferably 25 mol% or less, still more preferably 10 mol% or less.

Kindly replace paragraph [0057] with the following:

The (B) semi-aromatic polyamide may be a homopolymer, a mixture of homopolymers, a mixture with the above-described copolymer, or a mixture with other polyamide-based resins or other thermoplastic resins. In the mixture, the content of the (B) semi-aromatic polyamide is preferably 80 wt% or more, more preferably 90 wt% or more. Examples of the other polyamide-based resin and the other thermoplastic resin are the same as those resins described above for the (A) polyamide 11 and/or polyamide 12. Furthermore, a mixture with the (A) polyamide 11 and/or polyamide 12 ~~for use in the present invention~~ may also be used.

Kindly replace paragraph [0059] with the following:

The (C) fluorine-containing polymer having introduced into the molecular chain thereof a functional group having reactivity with a polyamide-based resin~~, for use in the present invention~~, indicates a fluorine-containing polymer where a functional group having reactivity with a polyamide-

based resin is present in the molecular structure (hereinafter sometimes referred to as a "(C) fluorine-containing polymer").

Kindly replace paragraph [0071] with the following:

The (C) fluorine-containing polymer ~~for use in the present invention~~ can be obtained by (co)polymerizing monomers constituting the polymer by a conventional polymerization method. Among these methods, a method using radical polymerization is predominantly used. More specifically, the means for initiating the polymerization is not limited as long as the polymerization radically proceeds, but the polymerization is initiated, for example, with use of an organic or inorganic radical polymerization initiator or under heat, light or ionizing radiation.

Kindly replace paragraph [0081] with the following:

The (C) fluorine-containing polymer ~~for use in the present invention~~ contains a functional group having reactivity with a polyamide-based resin, in the molecular structure. The functional group may be contained in any of the molecular terminal, the side chain and the main chain of the (C) fluorine-containing polymer. Furthermore, in the (C) fluorine-containing polymer, one functional group may be used alone, or two or more kinds of functional groups may be used in combination. The kind and content of the functional group are appropriately determined according to the kind, shape or use end of the other party material laminated on the (C) fluorine-containing polymer, the required interlayer adhesion, the bonding method, the functional group-introducing method and the like.

Kindly replace paragraph [0096] with the following:

In this way, the (C) fluorine-containing polymer ~~for use in the present invention~~ is a fluorine-containing polymer having introduced thereinto a functional group having reactivity with a polyamide-based resin. As described above, the (C) fluorine-containing polymer having introduced

thereinto a functional group can itself maintain excellent properties peculiar to (C) a fluorine-containing polymer, such as heat resistance, water resistance, low frictional property, chemical resistance, weather resistance, antifouling property and alcohol gasoline permeation-preventing property, and this is advantageous in view of productivity and cost.

Kindly replace paragraphs [0098] and [0099] with the following:

In the (C) fluorine-containing polymer ~~for use in the present invention~~, various fillers such as an inorganic powder, glass fiber, carbon fiber, a metal oxide and carbon may be blended according to the purpose or usage within the range of not impairing the performance of the polymer. Other than the filler, a pigment, an ultraviolet absorbent or other arbitrary additives may also be mixed. In addition to the additives, a resin such as another fluorine-based resin and thermoplastic resin, a synthetic rubber or the like may also be blended and this enables, for example, enhancement of mechanical properties and weather resistance, impartation of design property, prevention of electrostatic charging, or improvement of processability.

The (D) terminal modified polyamide ~~for use in the present invention~~ satisfies [A]>[B]+5, wherein [A] is the terminal amino group concentration (μeq/g-polymer) of the polyamide and [B] is the terminal carboxyl group concentration (μeq/g-polymer) of the polyamide (hereinafter referred to as a "terminal modified polyamide"). [A]>[B]+10 is preferred, and [A]>[B]+15 is more preferred. If [A]<[B]+5, the interlayer adhesion to the other party material stacked thereon is poor and this is not preferred. Furthermore, [A]>20 is preferred, and 30<[A]<80 is more preferred.

Kindly replace paragraph [0120] with the following:

The (D) terminal modified polyamide ~~for use in the present invention~~ may be a mixture with other polyamides or other thermoplastic resins. The content of the terminal modified polyamide in the mixture is preferably 60 wt% or more, more preferably 80 wt% or more. Examples of the other

resin are the same as those of the other resin in the case of the (A) polyamide 11 and/or polyamide 12. Furthermore, the terminal modified polymer may also be a mixture with the (A) polyamide 11 and/or polyamide 12 or (B) semi-aromatic polyamide for use in the present invention.

Kindly replace paragraphs [0122] through [0127] with the following:

The multilayer tube ~~according to the present invention~~ comprises at least three or more layers including a layer (a) comprising (A) polyamide 11 and/or polyamide 12, a layer (b) comprising (B) a semi-aromatic polyamide, and a layer (c) comprising (C) a fluorine-containing polymer having introduced into the molecular chain thereof a functional group having reactivity with a polyamide-based resin ((C) a fluorine-containing polymer).

In ~~a preferred embodiment~~one aspect, the multilayer tube comprises at least four or more layers including a layer (a) comprising (A) polyamide 11 and/or polyamide 12, a layer (b) comprising (B) a semi-aromatic polyamide, a layer (c) comprising (C) a fluorine-containing polymer, and a layer (d) comprising (D) a terminal modified polyamide.

In ~~a more preferred embodiment of the multilayer tube of the present invention~~another aspect, the layer (a) comprising (A) polyamide 11 and/or polyamide 12 is disposed as an outermost layer. When the layer comprising (A) polyamide 11 and/or polyamide 12 is disposed as an outermost layer, there occurs no environmental stress cracking due to an anti-freezing agent or the like.

In the multilayer tube ~~of the present invention~~, a layer (b) comprising (B) a semi-aromatic polyamide must be contained, and this layer is preferably disposed between the layer (a) comprising (A) polyamide 11 and/or polyamide 12 and the layer (c) comprising (C) a fluorine-containing polymer. The multilayer tube containing a layer (b) comprising (B) a semi-aromatic polyamide is excellent in the alcohol gasoline permeation-preventing property, particularly, hydrocarbon permeation-preventing property. Also, the multilayer tube containing a layer (c) comprising (C) a

fluorine-containing polymer is assured of excellent alcohol gasoline permeation-preventing property.

The multilayer tube ~~of the present invention~~ preferably contains a layer (d) comprising (D) a terminal modified polyamide, and this layer is preferably disposed between the layer (b) comprising (B) a semi-aromatic polyamide and the layer (c) comprising (C) a fluorine-containing polymer of the multilayer tube. By virtue of containing a layer (d) comprising (D) a terminal modified polyamide, excellent interlayer adhesion to the layer (c) comprising (C) a fluorine-containing polymer, particularly, excellent fuel resistance of interlayer adhesive strength, and over a long time, is ensured.

Also, in the multilayer tube ~~of the present invention~~, when an electrically conducting layer comprising a fluorine-containing polymer composition having incorporated thereinto an electrically conducting filler is disposed as an innermost layer of the multilayer tube, not only the chemical resistance and alcohol gasoline permeation-preventing property are excellent but also when used as a fuel piping tube or the like, sparking from the static electricity built-up due to internal friction of fuel circulating in the piping or due to friction between the fuel and the piping wall can be prevented. At this time, when a layer comprising a fluorine-containing polymer not having electrical conductivity is disposed outside the electrically conducting layer, both low-temperature impact resistance and electrical conductivity can be satisfied and this is also advantageous in view of profitability. The fluorine-containing polymer as used herein includes the (C) fluorine-containing polymer having a functional group in the molecular chain, which is specified in the present invention, and also includes a fluorine-containing polymer not having a functional group, which is described later.

Kindly replace paragraphs [0136] through [0140] with the following:

~~In the multilayer tube of the present invention, the~~The thickness of each layer is not particularly limited and can be controlled according to the kind of the polymer constituting each layer, the number of layers in the entire multilayer tube, the usage or the like. However, the thick-

ness of each layer is determined by taking into account the properties of the multilayer tube, such as alcohol gasoline permeation-preventing property, low-temperature impact resistance and flexibility. In general, the thickness of each of the layers (a), (b) and (c) and the layer (d) which is disposed if desired, is preferably from 3 to 90% of the entire thickness of the multilayer tube and, in view of alcohol gasoline permeation-preventing property, the thickness of each of the layers (b) and (c) is preferably from 5 to 80%, more preferably from 10 to 50%, of the entire thickness of the multilayer tube.

The number of layers in the entire multilayer tube ~~of the present invention~~ is not particularly limited as long as the multilayer tube comprises at least three layers including a layer (a) comprising (A) polyamide 11 and/or polyamide 12, a layer (b) comprising (B) a semi-aromatic polyamide, and a layer (c) comprising (C) a fluorine-containing polymer, preferably at least four layers including a layer comprising (A) polyamide 11 and/or polyamide 12, a layer comprising (B) a semi-aromatic polyamide, a layer (c) comprising (C) a fluorine-containing polymer, and a layer (d) comprising (D) a terminal modified polyamide. In addition to these four layers (a), (b), (c) and (d), the multilayer tube ~~of the present invention~~ may further have one layer or two or more layers comprising other thermoplastic resins so as to impart more functions or to obtain a profitably advantageous multilayer tube.

Figs. 1 to 3 show suitable structure examples of the multilayer tube ~~of the present invention~~. In the constitution of Fig. 1, the outermost layer 1 is a layer (a) comprising (A) polyamide 11 and/or polyamide 12, the intermediate layer 2 is a layer (b) comprising (B) a semi-aromatic polyamide, the innermost layer 3 is a layer (c) comprising (C) a fluorine-containing polymer. In the constitution of Fig. 2, similarly to Fig. 1, the outermost layer 1 is a layer (a) comprising (A) polyamide 11 and/or polyamide 12, the intermediate layer 2 is a layer (b) comprising (B) a semi-aromatic polyamide, the

innermost layer 3 is a layer (c) comprising (C) a fluorine-containing polymer, but in this example, a layer (d) comprising (D) a terminal modified polyamide is disposed as an inner layer 4 between the intermediate layer 2 and the innermost layer 3. The inner layer 4 may be disposed between the outermost layer 1 and the intermediate layer 2. In the constitution of Fig. 3, similarly to Fig. 2, the outermost layer 1 is a layer (a) comprising (A) polyamide 11 and/or polyamide 12, the intermediate layer 2 is a layer (b) comprising (B) a semi-aromatic polyamide, the inner layer 4 is a layer (d) comprising (D) a terminal modified polyamide, and the innermost layer 3 is a layer (c) comprising (C) a fluorine-containing polymer, but in this example, an electrically conducting layer 5 comprising a fluorine-containing polymer composition having incorporated thereinto an electrically conducting filler is further disposed inside the innermost layer 3.

The other thermoplastic resin includes a polyamide-based resin except for those specified ~~in the present invention~~herein (here, the resin except for those specified ~~in the present invention~~herein indicates a polyamide-based resin except for (A) polyamide 11 and/or polyamide 12, (B) a polyamide (semi-aromatic polyamide) comprising a dicarboxylic acid unit containing a terephthalic acid and/or naphthalenedicarboxylic acid unit in a proportion of 50 mol% or more based on all dicarboxylic acid units, and a diamine unit containing an aliphatic diamine unit having a carbon number of 9 to 13 in a proportion of 60 mol% or more based on all diamine units, and (D) a terminal modified polyamide satisfying a specific condition of terminal group concentrations), and examples thereof include polycaproamide (polyamide 6), polyethylene adipamide (polyamide 26), polytetramethylene adipamide (polyamide 46), polyhexamethylene adipamide (polyamide 66), polyhexamethylene azelamide (polyamide 69), polyhexamethylene sebacamide (polyamide 610), polyhexamethylene undecamide (polyamide 611), polyhexamethylene dodecamide (polyamide 612), polyhexamethylene terephthalamide (polyamide 6T), polyhexamethylene isophthalamide (polyamide 6I), poly-

nonamethylene dodecamide (polyamide 912), polydecamethylene dodecamide (polyamide 1012), polydodecamethylene dodecamide (polyamide 1212), polymetaxylylene adipamide (polyamide MXD6), polybis(4-aminocyclohexyl)methane dodecamide (polyamide PACM12), polybis(3-methyl-4-aminocyclohexyl)methane dodecamide (polyamidedimethyl PACM12), polynonamethylene isophthalamide (polyamide 9I), polynonamethylene hexahydroterephthalamide (polyamide 9T(H)), polydecamethylene isophthalamide (polyamide 10I), polydecamethylene hexahydroterephthalamide (polyamide 10T(H)), polyundecamethylene isophthalamide (polyamide 11I), polyundecamethylene hexahydroterephthalamide (polyamide 11T(H)), polydodecamethylene isophthalamide (polyamide 12I), polydodecamethylene hexahydroterephthalamide (polyamide 12T(H)), and a copolymer using several kinds of raw material monomers of these polyamides.

Also, the other thermoplastic resin includes a fluorine-containing polymer except for that specified ~~in the present invention~~herein (here, the fluorine-containing polymer except for that specified ~~in the present invention~~herein indicates a fluorine-containing polymer not having a functional group), and examples thereof include polyvinylidene fluoride (PVDF), polyvinyl fluoride (PVF), an ethylene/tetrafluoroethylene copolymer (ETFE), polychlorotrifluoroethylene (PCTFE), an ethylene/chlorotrifluoroethylene copolymer (ECTFE), a tetrafluoroethylene/hexafluoropropylene copolymer (TFE/HFP, FEP), a tetrafluoroethylene/hexafluoropropylene/vinylidene fluoride copolymer (TFE/HFP/VDF, THV) and a tetrafluoroethylene/fluoro(alkyl vinyl ether) copolymer (PFA).

Kindly replace paragraph [0142] with the following:

Incidentally, as the multilayer tube ~~of the present invention~~ is assured of excellent interlayer adhesion, a modified polyolefin-based resin which is usually disposed as an adhesive layer need not be used and among those thermoplastic resins, preferred are a polyester-based resin, a polyamide-based resin, a polythioether-based resin and a fluorine-containing polymer each having a melting

point of 165°C or more. Here, the melting point is defined as a temperature at a peak value in a melting curve measured by means of a differential scanning calorimeter by heating a sample at a temperature higher than the expected melting point, cooling the sample to 30°C at a rate of 10°C/min and after keeping this state for about 1 minute, elevating the temperature at a rate of 10°C/min.

Kindly replace paragraph [0144] with the following:

The number of layers in the multilayer tube ~~of the present invention~~ is 3 or more, but in view of mechanism of the tube producing apparatus, the number of layers is preferably 8 or less, more preferably from 4 to 7, still more preferably from 4 to 6.

Kindly replace paragraph [0150] with the following:

EXAMPLES

~~The present~~Selected, representative aspects of the invention is described in greater detail below by referring to Examples and Comparative Examples. However, ~~but~~ the ~~present invention is~~Examples do not limit~~ed thereto~~ the scope of this disclosure.

Kindly replace paragraphs [0227] through [0230] with the following:

INDUSTRIAL APPLICABILITY

~~The~~Our multilayer tube~~s of the present invention is~~are applicable to various uses including automobile parts, internal combustion applications, machine parts such as power tool housings, as well as engineering materials, industrial materials, electric and electronic parts, medical services, food products, household articles, office supplies, building material parts and furniture components.

Also, the multilayer tube~~s of the present invention is~~are suitable for chemical fluid-transporting piping. Examples of the chemical fluid include gasoline, kerosine, diesel gasoline, methanol, ethanol, propanol, butanol, alcohol-containing gasoline, methyl-tert-butyl ether, oxygen-containing gasoline, amine-containing gasoline, sour gasoline, castor oil-based brake fluid, glycol ether-type

brake fluid, boric acid ester-type brake fluid, brake fluid for very cold regions, silicone oil-type brake fluid, mineral oil-type brake fluid, power steering oil, window washer fluid, engine cooling fluid, medicine, ink and coating material. The multilayer tubes ~~of the present invention is~~are suitable as ~~a~~ tubes for transporting the above-mentioned chemical fluids, and specific examples of the tubes include a fuel tube such as a feed tube, a return tube, an evaporation tube, a fuel filler tube, an ORVR tube, a reserve tube and a vent tube, an oil tube, a break tube, a window washer fluid tube, a radiator tube, a cooler tube for cooling water, a cooling medium or the like, a cooling medium tube for an air conditioner, a tube for floor heating, a tube for a fire extinguisher or fire extinguishing equipment, a tube for medical cooling equipment, a tube for spraying ink or coating material, and a tube for other chemical fluids.

In particular, the multilayer tubes ~~of the present invention has~~have excellent alcohol gasoline permeation-preventing property and is suitable as a fuel tube. Furthermore, the multilayer tubes ~~of the present invention has~~have excellent heat resistance and ~~is~~are useful also as a tube for transporting a high-temperature chemical fluid or gas.

Accordingly, the multilayer tubes ~~of the present invention is~~are applicable in any environment which requires high reliability and has a very great utility value in industry.